

# REPORT

## **Selsey Haven - Key Issues Study**

Client: Chichester District Council

Reference: WATPB3800R001F0.1

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HASKONINGDHV UK LTD.

Burns House  
Harlands Road  
Haywards Heath  
West Sussex  
RH16 1PG  
Water  
VAT registration number: 792428892  
  
+44 1444 458551 **T**  
info.haywards.heath@uk.rhdhv.com **E**  
royalhaskoningdhv.com **W**

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Author(s): Thomas Green, David Brew and Alexander Lee

Drafted by: Thomas Green

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Checked by: Alexander Lee

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## 1 Introduction

### 1.1 Project background

A partnership between Selsey Fishermen's Association, Selsey Town Council and Chichester District Council are investigating the feasibility of constructing a small haven along East Beach Green, Selsey, West Sussex, Figure 1-1.

In 2015 to 2016 preliminary consultation was undertaken to explore the technical and environmental issues that may have an impact on gaining planning permission and associated licences and consents necessary to build the small haven. Three initial concept options were presented during this consultation as a framework for discussion. These options were explored with the regulators and key stakeholders during a technical workshop held on the 3<sup>rd</sup> December 2015. Representation was made by the following:

- Environment Agency
- Natural England
- Chichester District Council Planning Department
- Chichester District Council Coastal Engineer
- Arun District Council Coastal Engineer
- Crown Estate
- Marine Management Organisation
- Selsey Fishermen's Association
- Selsey Town Council
- Manhood Peninsula Partnership
- Coastal West Sussex Partnership.

Following the workshop a preliminary consultation report was produced summarising the outcomes of the workshop. A copy of the report can be found in the following website link and within Appendix A.

([http://peninsulapartnership.org.uk/abd/wp-content/uploads/2016/03/Selsey-Haven\\_FINAL.pdf](http://peninsulapartnership.org.uk/abd/wp-content/uploads/2016/03/Selsey-Haven_FINAL.pdf))

Out of all the topics considered impacts on the local coastal processes, and in particular sediment transport, were found to be the more critical, along with the function and operation of the haven.

### 1.2 Aims of the Key Issues Feasibility Study report

As a follow on from the preliminary consultation Royal HaskoningDHV were commissioned in March 2017 by Chichester District Council, who are working in partnership with Selsey Fishermen's Association and Selsey Town Council, to undertake a study of 'key issues' to provide further information and obtain updated feedback from key regulators and stakeholders. The following key issues were investigated:

- A review of the available bathymetric data.
- A review of the available data on sediment transport.
- A review of the location, orientation, configuration and nature of the haven entrance.
- A review of the feasibility and acceptability of regular beach by-passing.
- A review of the ground conditions.
- A review of the feasibility and acceptability of constructing the haven close to a residential area.
- The preparation of a preliminary business case for the development, construction and operation of the haven.

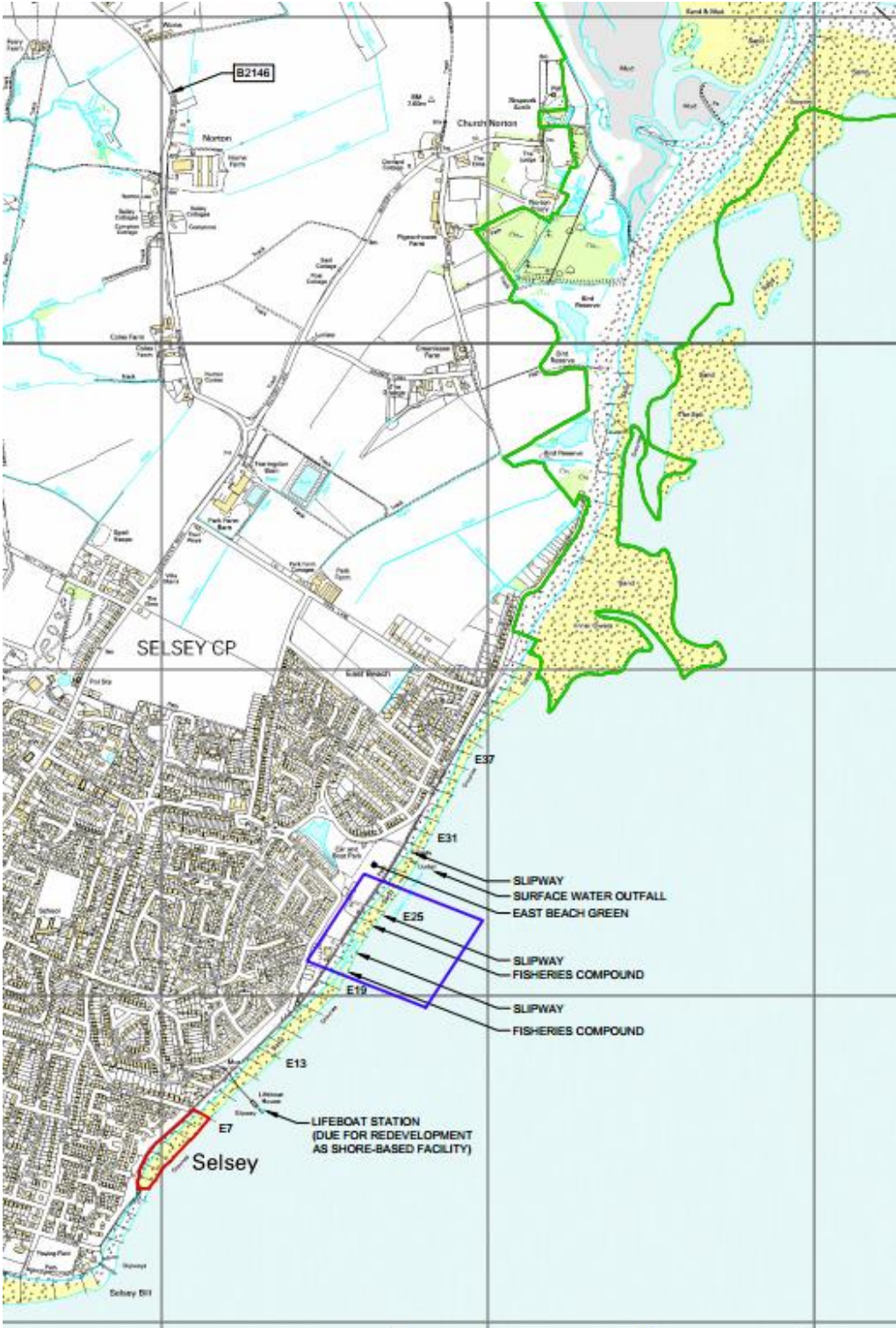


Figure 1-1: Study area

### 1.3 Report structure

The report is structured as follows:

- Section 2 – Updated concept design
- Section 3 – Consultation
- Section 4 – Preliminary business case
- Section 5 – Revised concept design
- Section 6 – Conclusion and recommendations
- Section 7 – References

## 2 Updated concept design for consultation

### 2.1 Introduction

As described in Section 1.1 a concept design of the haven was developed in the previous phase of the project. This is described in further detail in Section 2.2, below. Further assessment of ground conditions, bathymetric data, coastal processes, as well as the location and orientation of the haven has now been completed and the outcome of these assessments are presented from Section 2.3 to Section 2.6. These assessments have fed into an updated concept design for consultation, which is presented in Section 2.7.

### 2.2 Summary of design development undertaken during the preliminary consultation phase

Three conceptual ideas were presented during the preliminary consultation in 2015 to 2016 which provided a framework for identifying and discussing key issues and assessing their potential impacts, particularly with regards to obtaining the required approvals, licences and consents. The options also provided a basis for assessing the function and operation of the haven, its construction and maintenance.

None of the options were intended to represent a final design but between them they provided a broad basis for evaluation and comparison. Their purpose was to convey the main principles involved with each option. It was intended that later stages of the project would develop outline designs which would give closer attention to positioning, configurations and form of construction.

All three options were located along East Beach Green and their positions coincided with two fisheries compounds and deeper water in the nearshore zone.

The three options are summarised below and illustrated in Figure 2-1 to Figure 2-3.

- Option 1: This option straddles the land and foreshore in respect of its cross-shore location. Its working principle is to remain within the influence of the groyne field and not encroach any further seaward of low water, with the intention of restricting its additional impact on the natural coastal processes.
- Option 2: This option straddles the foreshore and nearshore in respect of its cross-shore location. Its working principle is to represent a 'classic' artificial haven on an open coastline.
- Option 3: This option is entirely situated within the nearshore zone in respect of its cross-shore location. Its working principle is to allow the longshore inter-tidal sediment transport to continue unhindered.



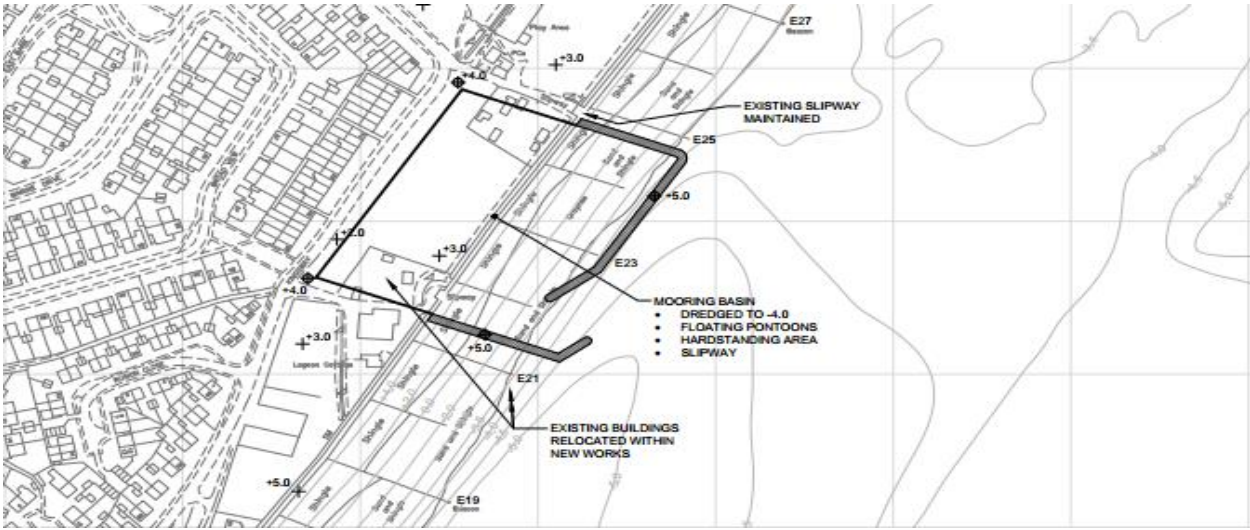


Figure 2-1: Previous concept option no. 1

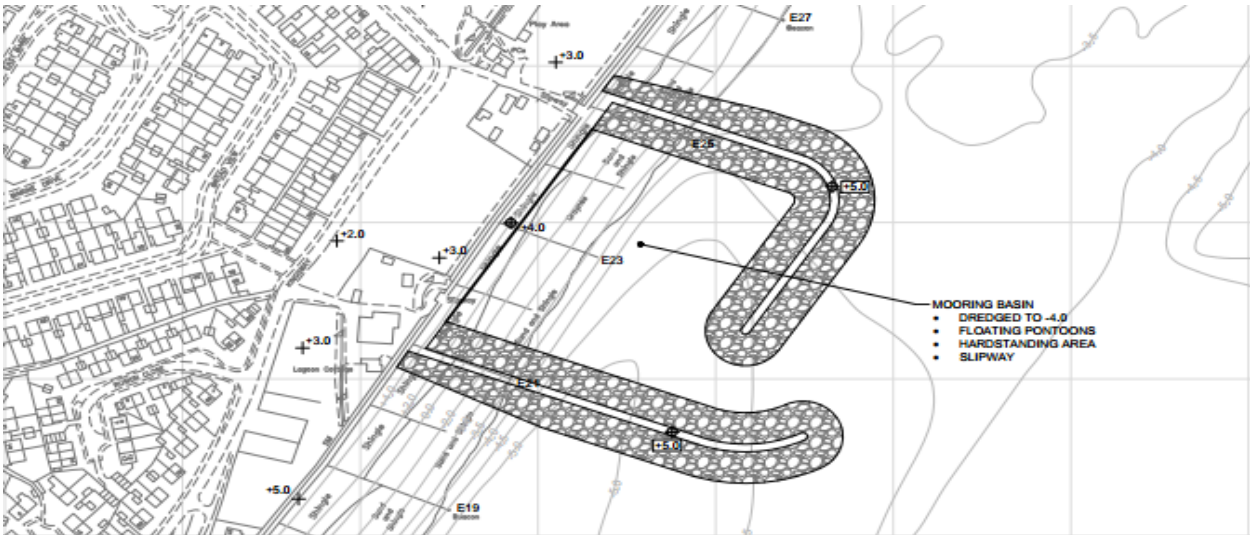


Figure 2-2: Previous concept option no. 2

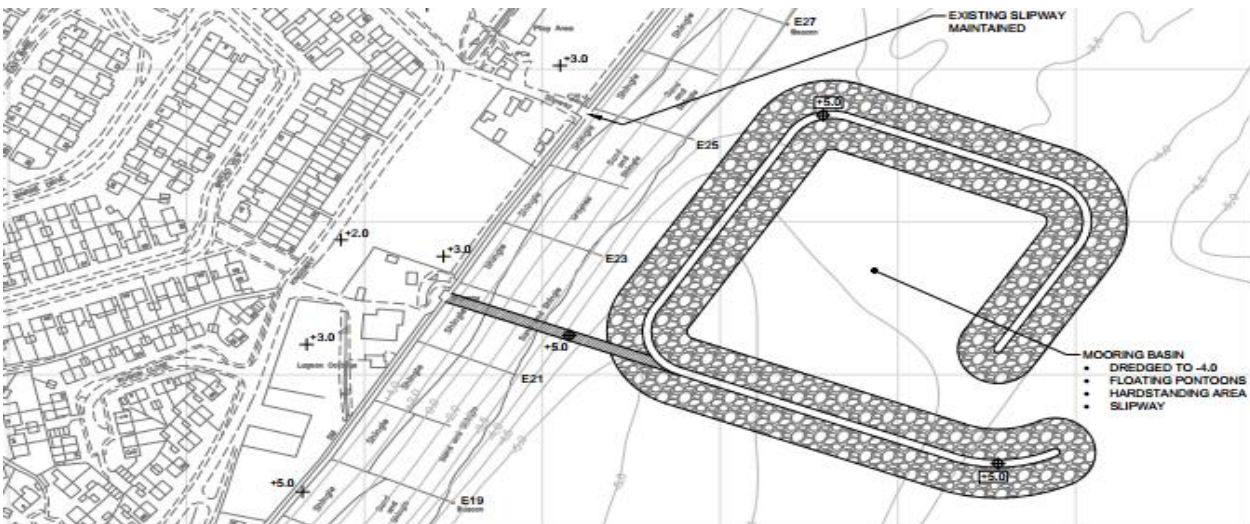


Figure 2-3: Previous concept option no. 3

The main conclusions from the preliminary consultation were as follows:

- Sediment transport is by far the most critical issue particularly in respect of obtaining the necessary permissions and licences for the haven.
- Option 1 was considered the most favourable because it has the lowest impact of coastal process and sediment transport. Noting that this option would need refinement.
- With Option 1 it would still be necessary to undertake regular beach bypassing to maintain existing sediment transport along East Beach.
- With Option 1 there could be significant impacts on the adjacent properties and these impacts need to be examined more closely.
- Option 1 minimised the amount of encroachment onto East Beach Green.
- The haven entrance would need to be looked at more closely to ensure maximum accessibility under a range of operating conditions.

For this reason, option 1 was identified as the most favourable option because it had the lowest potential impact on sediment transport and coastal processes whilst providing a balance in terms of land encroachment.

## **2.3 Review of ground conditions**

### **2.3.1 Ground conditions geotechnical desk study**

#### **2.3.1.1 Introduction**

A geotechnical desk study was undertaken to identify what geotechnical / geological data is available along with a look at the Environment Agency's 'What's in my back yard' website.

#### **2.3.1.2 Available information**

The following information was used in the study:

- Solid and Drift Geology, 1:50,000 Series, England and Wales – Sheet 332, Bognor (British Geological Survey, 1974).
- BGS geology viewer available on the BGS website
- (<http://mapapps.bgs.ac.uk/geologyofbritain/home.html>, accessed 22/05/17).
- Borehole Logs obtained from the BGS GeoIndex website (British Geological Society <http://mapapps2.bgs.ac.uk/geoindex/home.html>, accessed 22/05/17).
- "What's in my backyard" website (Environment Agency, <http://apps.environment-agency.gov.uk/wiyby/>, accessed 22/05/2017).
- Selsey Haven – Key Technical Issues Consultation Report – 2017.
- UXO Hazard Map for Selsey (ZeticaUXO, 2017).
- Site Plan – drawing PB3800/0002.

#### **2.3.1.3 Geology**

The information in the following paragraphs has been extracted from the BGS 1:50,000 scale mapping sheet 332 (Bognor) and the BGS geology viewer.

##### *Superficial geology*

Generally the geological map and viewer indicates the superficial deposits beneath the haven site comprise of the following:

- **Alluvium:** The Selsey Haven site appears to be in the location of an old river channel and as due to this estuarine alluvium could be present across the whole site or just part of it. The alluvium is likely to be found beneath any made ground/topsoil, or at ground surface across and could comprise sands, silts and clay.
- **River Terrace Deposits:** The river terrace deposits indicated on the geology map and viewer are again present due to the old river channel mentioned above. According to the map and viewer they again consist of sands, silts and clay and so are very similar to the alluvium and it is possible it is the same formation.
- **Raised Marine Deposits:** The raised marine deposits shown on the map are localised to the Selsey Haven site only and consists of gravels, sand, silts and clay, again very similar to the alluvium and river terrace deposits so it is possible that they are all the same strata with different designations.

#### 2.3.1.4 Solid geology

Generally, the geological map and viewer indicates the solid geology beneath and within close proximity to the site to comprise the Bracklesham Group Lithology from the Eocene Epoch. The Bracklesham Group is made up of several sub groups up to 140m thick and three of these could be present directly below the superficial deposits below the Selsey Haven site. The three units running from north to south are as follows:

- **Earnley Sand Formation:** Consists of Sand, Silt and Clay forming the sedimentary bedrock that was formed approximately 40 to 49 million years ago, in the Palaeogene Period. Local environment previously dominated by shallow seas during deposition. The deposit is generally 22-25m thick and overlies the Wittering Formation, which is also part of the Bracklesham Group.
- **Marsh Farm:** Consists of Clay, Silt and Sand forming the sedimentary bedrock formed approximately 40 to 49 million years ago in the Palaeogene Period. Local environment previously dominated by shorelines. The deposit is generally 12-13.5m thick and overlies the Earnley Sand formation.
- **Selsey Sand:** Consists of Sand, Silt and Clay forming the sedimentary bedrock formed approximately 40 to 49 million years ago in the Palaeogene Period. Local environment previously dominated by shallow seas. The deposit is generally 25-27m thick and overlies the Marsh farm formation.

As can be seen from the descriptions above the bedrock formations are very similar and the limited information currently available cannot differentiate between the three units described above.

#### 2.3.1.5 Previous Site Investigations

##### *Selsey Bill Sea Defence Scheme (1953)*

Acting on behalf of Lewis and Duvivier consulting engineers a site investigation was carried out by an unknown ground investigation contractor in August 1953. The borehole records were obtained from the BGS Geo-Index site and consisted of six cable percussion boreholes in the vicinity of the Selsey Haven site to a maximum depth of 10.7m below ground level.

The boreholes were carried out in two rows, the first along the line of the promenade and the second along the foreshore starting around 2-3m below the promenade. The general ground profiles are shown on sketches 1 and 2 in Appendix E and these show the ground consists of various layers of sands, silty sands, gravelly sands, silty clays and clays of varying thickness. The layers vary both vertically and laterally across the site producing variable ground conditions. The available information provided very limited information about the strength/consistency of the deposits but generally the sands and silts appear to be loose to medium dense and the clays are soft to firm.

Groundwater was encountered during the investigation and the level varied with the tide during the works.

The only information available about the ground investigation is limited to the borehole logs and so no further information such as laboratory testing for geotechnical or land quality or services information can be provided in this note.

#### **2.3.1.6 Other information**

Additional information about the site has been source from the Environment Agency's "What's in my backyard" site and this is summarised below:

- a) Pollution – Significant incident in August 2010 that impacted the water in Selsey Pond adjacent to the Haven site.
- b) Compliance Rating – The Selsey mobile civic amenity site is adjacent to the Haven site and has no breaches indicating no reportable contamination incidents in the last 5 years.
- c) Landfill – No landfills in the area.
- d) Flood warning – As expected the area is in a flood warning zone.
- e) Nitrate Vulnerable Zone – It is proposed that the area will become a Nitrate Vulnerable Zone sometime in 2017.

There are no other issues reported on "What's in my backyard".

#### **2.3.1.7 Conclusions**

The underlying ground conditions vary from north to south and the change is broadly along the site centreline running perpendicular to the coast. The northern section appears to be underlain by sands and silts with occasional thin clay layers to the base of the boreholes and the southern section appears to be underlain by silty clays with occasional clayey sand bands to the base of the boreholes. The study does indicate that although ground conditions do not pose a significant problem, the better ground conditions for design and construction are to the north of the site.

## **2.4 Review of bathymetric data**

In 2016 the Channel Coastal Observatory commissions a bathymetric survey along Selsey. Figure 2-4 presents the extent of the survey undertaken and Figure 2-5 presents the detailed bathymetry along the Selsey East Beach frontage. The survey provides the most up to date information on sea bed levels and these have been taken into consideration within the design of the haven entrance arms and this has enabled a more accurate assessment to be made on the arrangement of the haven entrance.

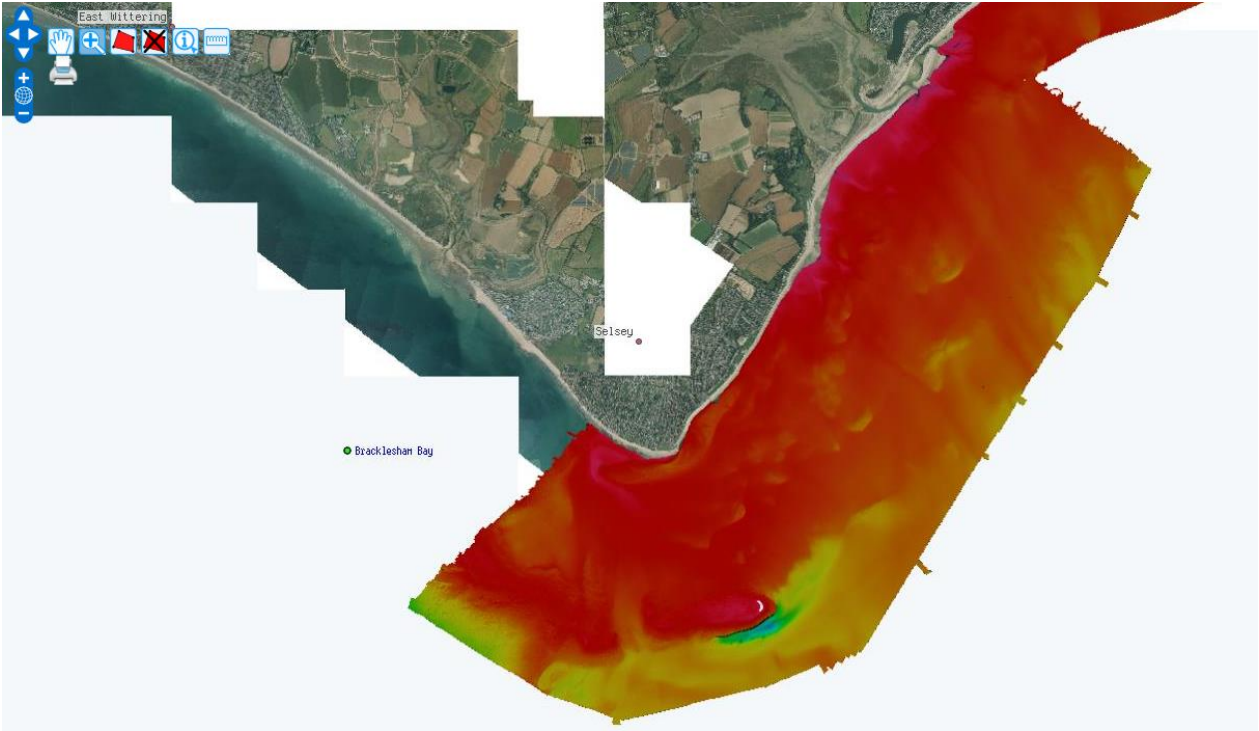


Figure 2-4: Available bathymetry along Selsey. Extract from the Channel Coastal Observatory.

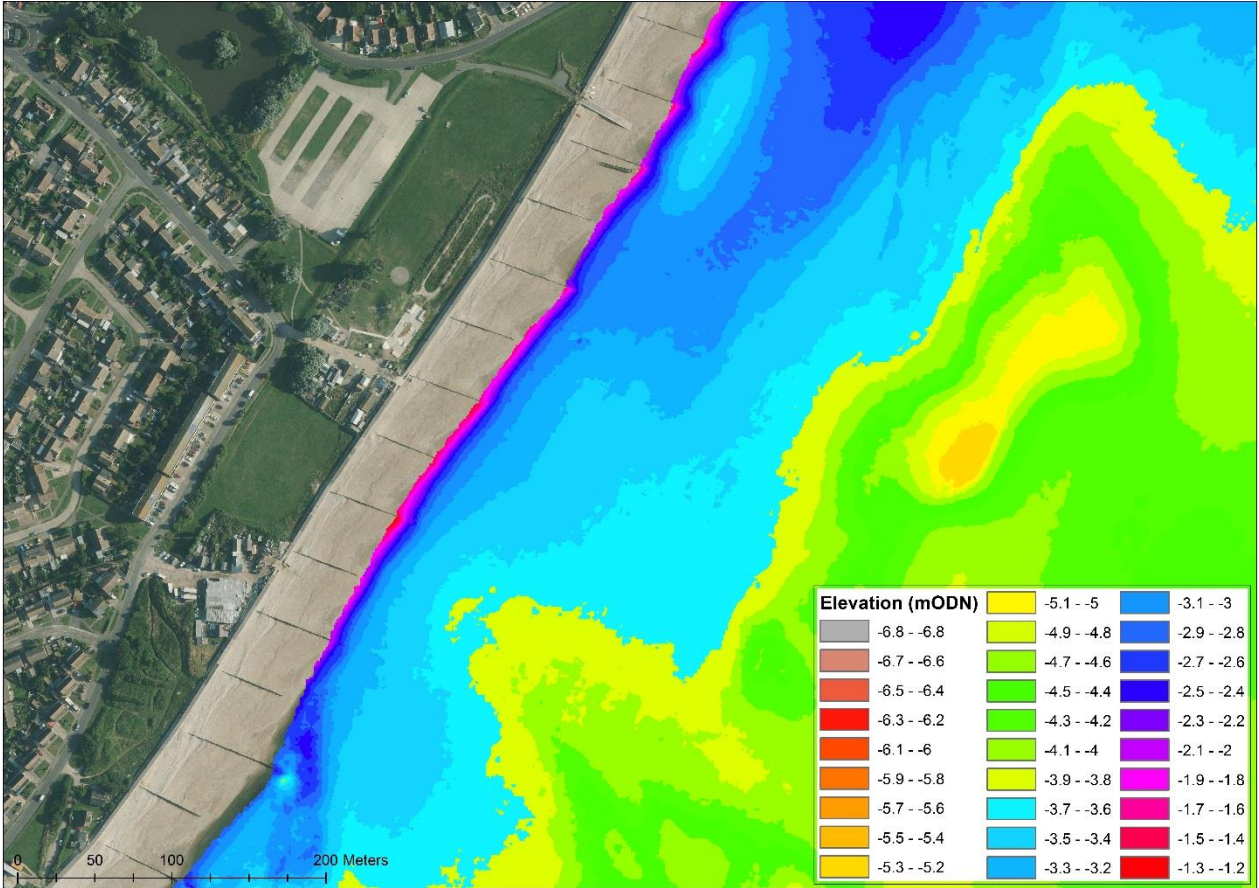


Figure 2-5: Detailed bathymetry along Selsey Each Beach frontage.

## 2.5 Review of coastal processes

### 2.5.1 Sediment transport and coastal processes

A search for available published data was undertaken to collate a detailed understanding of the sediment transport along East Beach and the surrounding coastline. The following is based on existing available literature and our knowledge of the Solent, in particular along the Selsey Bill to Pagham Harbour frontage.

For the Selsey Bill to Pagham frontage there are believed to be two offshore to onshore sediment supplies. The first is to the south of the haven location, from the Kirk Arrow Spit onto Selsey Bill. The second, is to the north of the haven location, from the Inner Owers. Both of these locations are presented on Figure 2-6, below). The SCOPAC Sediment Transport Study (2004) estimates that the Kirk Arrow Spit supply to be between 10,000 and 20,000 cubic metres per annum and the Inner Owers supply between 20,000 and 40,000 cubic metres per annum.

For East Beach, between Selsey Bill and the Inner Owers, Lewis and Duvivier (1976) assessed the south to north sediment transport rate without groynes to be of the order of 15,000 to 25,000 cubic metres per annum, and approximately 10,000 cubic metres per annum with groynes.

Hume Wallace (1990/1996) inferred a sediment transport rate of 42,000 cubic metres per annum without groynes. However, this rate is based on the observed build-up of sediment to the south of the Pagham Harbour entrance and it would seem that no allowance has been made in this calculation for sediment transported onshore from the Inner Owers. This figure may therefore be regarded as an over estimate.

HR Wallingford (1995) modelled south to north potential longshore transport rates of about 32,000 to 33,000 cubic metres per annum for the frontage from East Beach to Pagham Harbour. A corresponding potential rate of 8,000 cubic metres per annum is given for a groyne frontage. The HR Wallingford modelled potential transport rate is higher than the conceptual rate of Lewis and Duvivier (1976) although the HR Wallingford upper beach quantity is more corresponding to Lewis and Duvivier than the rate estimated by Hum Wallace (1990/1996). Figure 2-6 presents the East Head to Pagham sediment Transport from SCOPAC (2004).



Figure 2-6: East Head to Pagham, West Sussex sediment transport. Extract from SCOPAC (2004).

A regional shingle sediment budget for Selsey Bill to Brighton Marine covering the period of 2003 to 2012 was undertaken by the South East Coastal Group for the Environment Agency.

The study reported that transport rates vary across the frontage as a result of defence structures. Calculations from the study suggest 12,500 cubic metres per annum is transported onshore from Kirk Arrow Spit and feeds into Selsey. The sediment transport through East Beach Green is 17,500 cubic metres per annum and the net export east from Selsey is 15,700 cubic metres per annum. The study also reports that sediment transport from Selsey does not satisfy the 28,300 cubic metres per annum gain at Pagham, suggesting material is transported onshore at Selsey and Pagham. Figure 2-7 illustrates this.

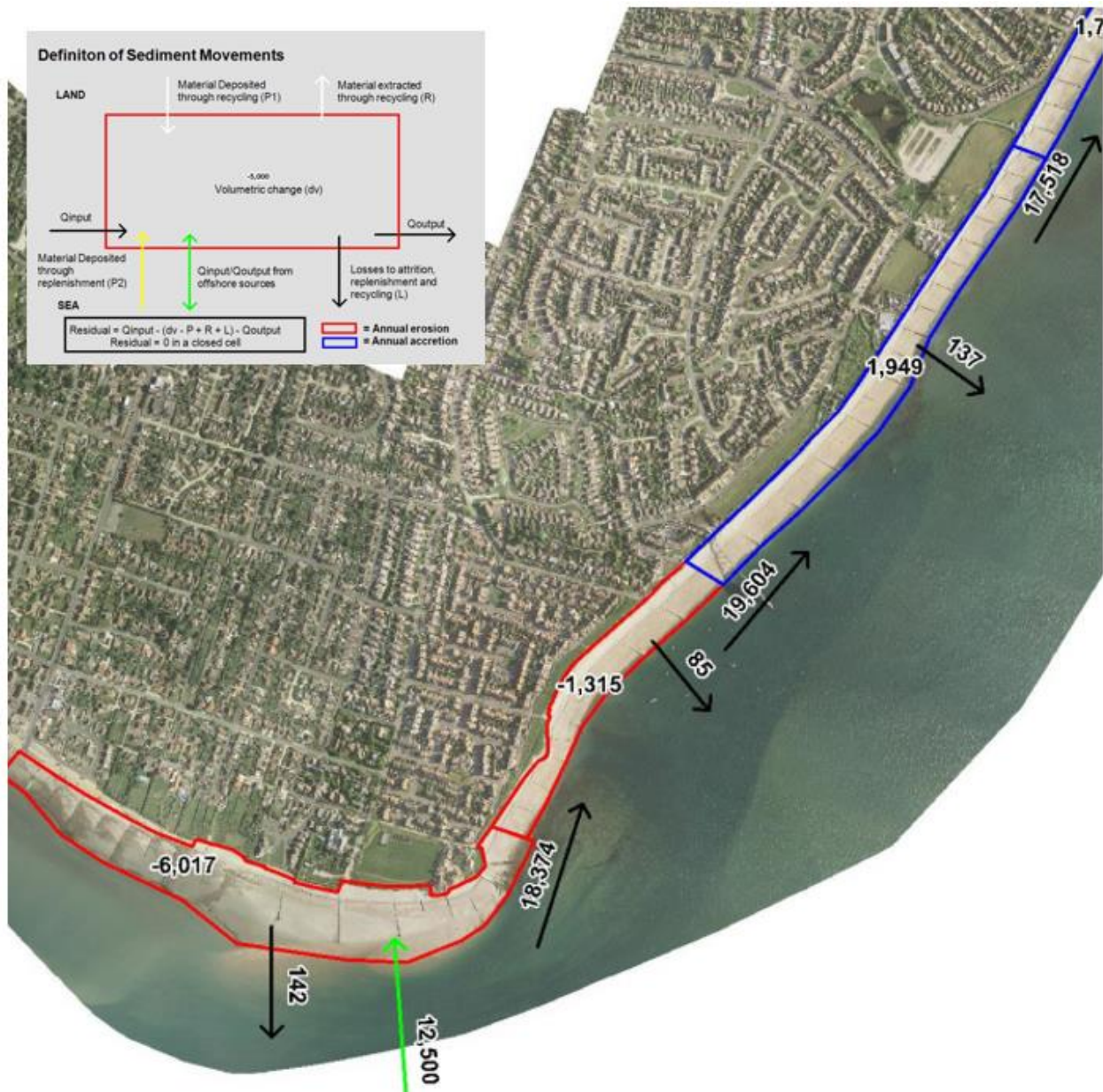


Figure 2-7: Sediment Budget along Selsey. Extract from the Regional Shingle Sediment Budget: Selsey Bill to Brighton Marina 2003 - 2012 (2013).

Assuming the sediment transport rates of 8,000 cubic metres (predicted by HR Wallingford in 1995) to 15,699 cubic metres per annum (predicted by the Regional Shingle Sediment Budget in 2013) suggests that there is an ongoing sediment transport feed from west to east through Selsey East Beach. Also assuming that the onshore supply to East Beach from Kirk Arrow Spit is on average between 10,000 to 20,000 cubic metres per annum suggests that there should be an ongoing steady accretion with time on the East Beach frontage. As illustrated in Figure 2-7 there is evidence of accretion along East Beach with 1,949 cubic metres per annum of shingle being deposited along East Beach.

In summary, net sediment transport along the coast at Selsey is from south to north at rates reported between 10,000 to 20,000 cubic metres with present coastal management in place.



## 2.6 Review of location and orientation

The recent bathymetric survey was taken into consideration in the design and position of the harbour entrance and extent of the arms.

## 2.7 Description of concept design for consultation

Following review of the information as presented above in Section 2 the concept design determined in the previous phase of the project has been updated, with its design and operation envisaged as follows:

The main construction will be in twin walls of steel piles with a concrete deck. Most of the walls will be in steel sheet piling (a non-permeable face) but in key locations intermittent piles will be used that present a permeable face. Where there are two lines of steel sheet piles, general granular fill will be placed between them. Where intermittent piles occur, armourstone fill will be used. The use of armourstone in this way will reduce wave reflections off the wall and provide some absorption of wave energy.

Permeable walls will be used around the entrance area and along the seaward face of the haven. For the entrance area the intention is to facilitate access into the haven under heavy sea conditions. For the seaward face the intention is to encourage the build-up of beach material in front of the haven in order to promote natural by-passing.

The entrance area and mooring basin will be excavated down to below Mean Low Water Spring tide level in order to provide an all-tide facility.

From the excavation arisings the beach material will be placed on the foreshore to the north and the rest of the material will be placed on the green area to the north in order to raise it to the same level as the existing seawall promenade.

The mooring basin will be equipped with 3 sets of floating pontoons (1 dedicated to the fishermen, 2 dedicated to leisure use) comprising a central pontoon with finger pontoons either side. Access to the pontoons will be from the West Quay via articulated ramps. The basin will also be equipped with a fixed slipway for launch and recovery of craft, and for haven maintenance.

The quaysides and pier structures will be kept clear of any significant buildings in order to maintain access for vehicles and reduce visual impact.

Immediately to the south of the haven there will be an area for the fishermen's compound, and immediately to the north, an area for haven and public facilities.

The fishermen's compound will have direct access from Kingsway. Also the fishermen's pontoon will be the closest to their compound.

The area for haven and public facilities will provide space for new development and compensate for an existing public area that will be lost to the new works. The area will also have direct access from Kingsway.

To the south and north of the haven there will be beach ramps. The one to the south is primarily for plant access for beach by-passing purposes. However it could also act as a "back-up" to the fishermen. The one to the north is for both plant access for beach by-passing and for general public use.

For beach by-passing the anticipated haulage route is along the South, West and North Quays and then the road that runs along the seaward side of the green area. Beach material would be excavated from the south side of the haven and deposited on the north side in the vicinity of the beach ramp.

For general public use of the beach ramp to the north of the haven, there will be access from the existing Car & Boat Park and from the new quayside development area.

Figure 2-8 and Figure 2-9 presents the updated concept design site plan for consultation.

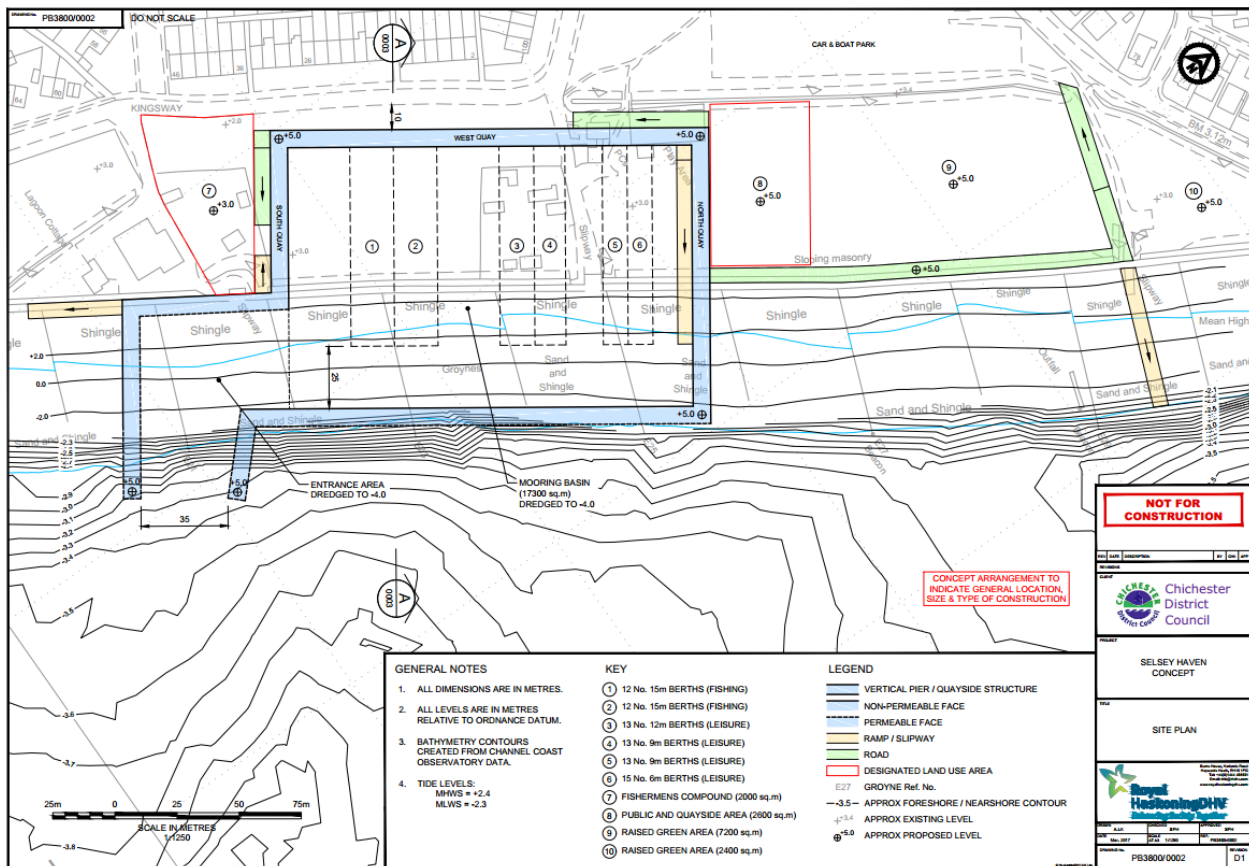


Figure 2-8: Updated concept design for consultation overlaying OS Master Map.

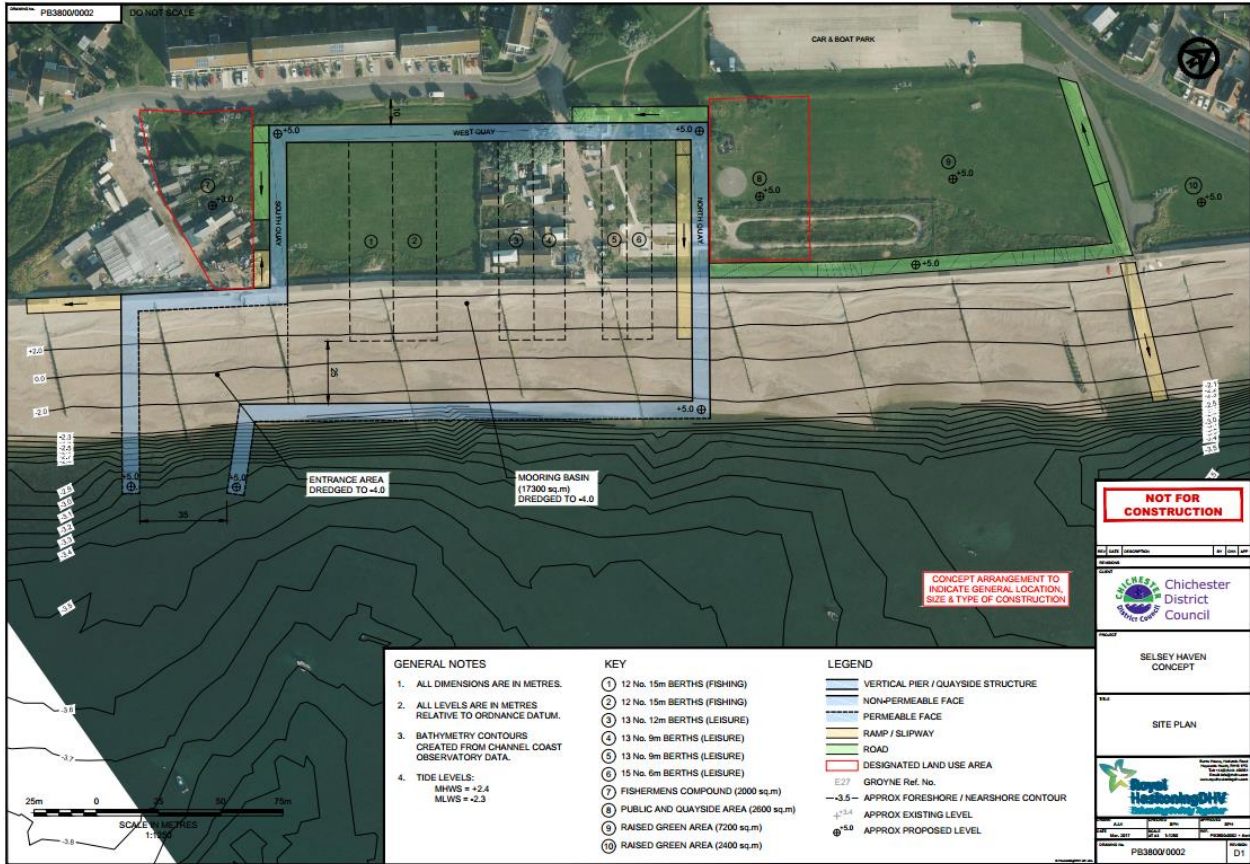


Figure 2-9: Updated concept design for consultation overlaying aerial mapping.

### 3 Consultation

#### 3.1 Introduction to consultation

Royal HaskoningDHV undertook consultation with regulators and key stakeholders on the following overarching themes:

1. Sediment transport
2. Beach bypassing
3. Proximity to residential area
4. Operation of the haven
5. Impacts on coastal management
6. General comments

To facilitate the consultation the following was issued, copies of which are presented in Appendix B:

- An updated location plan that incorporates recent bathymetric data from 2016, a wave rose and a wind rose.
- An updated concept design site plan that provides more detail on access arrangements, berthing arrangements, and adjacent land use (also presented in Figure 2-8, above).
- A concept design cross section through the haven that illustrates its proximity to, and visual impact on, the nearby properties.
- A brief commentary on the anticipated design and operation of the haven.
- A brief commentary on the local coastal processes.

Table 3-1 presents the regulators and key stakeholders consulted and the area in which they were consulted and Section 3.2 outlines the questions asked under each area.

Table 3-1: Consultatee list

Organisation	Contact	Position
Natural England	Kate Bull	Marine Lead Advisor
Environment Agency	Uwe Dornbusch	Coastal Team Specialist
Chichester District Council	Steve Oates	Economic Development Manager
Chichester District Council	Dominic Henly	Senior Engineer
Chichester District Council	Steve Harris	Planner
Arun District Council	Roger Spencer	Senior Engineer
Selsey Fishermen's Association	Robert Greenwood	Secretary
Selsey Fishermen's Association	Chris Harvey	Chairman
JT Mackley	Various	-

## **3.2 Questions asked at consultation**

Consultees were asked to comment, where applicable, on the following.

### *Sediment transport*

- Our understanding of coastal processes in the area of interest and the potential impacts of the haven on sediment transport.

### *Beach bypassing*

- The acceptability of beach by-passing as an ongoing means of compensating for any interruption in the natural longshore sediment transport to the north of the haven.
- Any foreseen issues associated with the artificial by-passing operation.
- What could be an appropriate method for beach bypassing.

### *Proximity to residential area*

- The acceptability of the proposed haven in relation to the adjacent residential area.
- A review of the ground conditions across the site and East Beach Green.

### *Operation of haven*

- The revised haven entrance and orientation and its accessibility under a range of operating conditions.
- The general layout and operation of the haven.

### *Other questions*

- Impacts on the wider coastal management.

## **3.3 Consultation feedback**

The following sections summarises our feedback during the consultation period. The section has been divided into feedback on the themes discussed above, followed by other general comments received. The full responses from each of the consultees is provided in Appendix C.

### **3.3.1 Sediment transport**

#### **3.3.1.1 Feedback from Natural England**

Natural England provided some further information that supported our data regarding general sediment transport mechanisms and the importance of the sediment transport with regards to the environmental designations.

Natural England noted that maintaining sediment transport system between Selsey Bill and Pagham Harbour is paramount to the protection of the features in the associated designated sites. These sites include the Special Protection Area, Ramsar Site, Site of Special Scientific Interest and Marine Conservation Zone. It was also noted that sediment changes may impact the exposure of fossils in other geological sites, Selsey, East Beach and Bognor Reef.

In summary, there is a clear sediment pathway from Selsey Bill (to the west) along the coast to Pagham Harbour (to the East). The extent of the potential impacts on sediment transport and the designated features are currently unknown and this would need to be better understood.

### **3.3.1.2 Feedback from the Environment Agency**

The Environment Agency provided Royal HaskoningDHV with a recent report on longshore transport rates undertaken by the South East Coastal Group. The report complimented and updated the information on transport rates and this has been included in Section 2.5.

### **3.3.1.3 Feedback from Chichester District Council**

The information on coastal processes and sediment transport was accepted to be good by the Council. The Council noted that there have been significant variations in shingle longshore drift along the frontage, with rates increasing after significant periods of on-shore sediment transport from Kirk Arrow and reducing in times of low supply from Kirk Arrow. The Council said that the bypassing process would need to be linked to regular monitoring of the groyne bays in order to ensure that bypassing is undertaken at appropriate times. It was felt that there would some natural bypassing of the haven and that the further seaward the haven arm is, the more this will be restricted, but again the actual impacts of this are unknown.

### **3.3.1.4 Summary of feedback**

- Our general understanding of sediment transport processes is correct.
- There is a clear recognised sediment pathway from Selsey Bill along the coast to Pagham Harbour which needs to be maintained.
- It is accepted that annual shingle transport volumes vary which is linked to the supply fluctuations along Kirk Arrow Spit.

## **3.3.2 Beach bypassing**

### **3.3.2.1 Feedback from Natural England**

Natural England's main concern is that the proposed option extends onto the beach within the intertidal zone of the beach which they consider is likely to change the natural functioning and movement of sediments from within the cell (west to east).

The ability of the geomorphology interest of Pagham Harbour SSSI to evolve unhindered will be compromised in their view and they want to ensure that feed of sediment to down drift areas (Inner Owers) and beyond to Church Norton Spit is conserved as far as reasonably possible.

They consider that any alteration to the natural movement of material along the coastline; specifically halting, altering or removing the longshore (as well as cross-shore) movement of material is likely to have an impact on the Geological Conservation Review site (compromising the rapid extension of the spit) and therefore the conservation status of Pagham Harbour SSSI.

They consider that the proposed haven is unlikely to conserve and advance the Pagham Harbour SSSI interest features, and, as a result the worst case scenario would be a depletion of material reaching Inner Owers and subsequently the Pagham System (Pagham Harbour SSSI), potentially compromising the ability of particularly the Church Norton Spit to rapidly extend. They consider that it is highly likely material would build up on the updrift end of the structure.

Natural England also said that erosion could occur to the down drift side of the haven as material would not pass round the obstacle. They were also concerned that this would be accelerated in the future as the longshore supply of sediment is cut off.

Natural England were also concerned that the outer haven wall could cause beach draw down under more reflective wave conditions, and that this could also further impact sediment movement, both longshore and cross-shore.

Natural England suggest that the natural processes are not completely understood and the dynamic nature of this sediment supply would be difficult, if not impossible, to replicate by the by-passing of sediment.

In summary, Natural England were concerned that the geomorphological interest of Pagham Harbour SSSI would not be maintained as a result of changes to the sediment supply and the habitats and species that result and depend on the geomorphological shingle features (spit, saline lagoon etc.) would be adversely affected. Again, Natural England noted that the extent of the impacts on sediment transport and the designated features are currently unknown and this would need to be understood.

#### **3.3.2.2 Feedback from the Environment Agency**

The Environmental Agency stated that the frequency and magnitude of by-passing will be important to mitigate as much as possible against the impact the haven could have on sediment transport.

The Environment Agency raised concerns that the seaward quay wall may on its own reduce the potential of beach build up. They considered that some shingle would inevitably enter the haven mouth and that this could be mixed with finer sediments making it much less useful as a source of material to be placed on the down drift beach. They considered that this could result in by-passing coupled with beach recharge on occasions.

They said that the recovery of material on the updrift end would be best carried out during spring low tides, which at Selsey often occurs over weekends either early morning or late afternoon, with the former having a particular impact on residents behind the beach.

The Environment Agency expressed that they would have like to see a more land based option investigated.

#### **3.3.2.3 Feedback from Chichester District Council**

Chichester District Council understood that beach by-passing would be a necessary process to compensate for natural sediment transport. They also said that the shorter the haven arms were the more natural by-passing that should occur, therefore reducing the required quantity of artificial by-passing efforts.

The Council also raised the question of whether a new road would be necessary along the Green and that wave overtopping would also need to be considered in the design as currently wave overtopping is contained within the Green before draining back out to sea at East Beach outfall. The Council also noted that there may be an opportunity for beach huts along the frontage in the future.

#### **3.3.2.4 Feedback from Arun District Council**

Arun District Council agreed that artificial by-passing would be required. They were concerned that there may be a tendency for the shingle longshore transport pathways to be deflected offshore at the haven, which could be a slight deviation or may be significant, and that it may even happen via the interaction with the vertical face of the haven arm. The Council noted that any changes could have an impact on Pagham although they recognise that drift volumes are small from Kirk Arrow compared with the Inner Owers and so the Inner Owers will be the predominant system. The Council also noted that anecdotal evidence puts a large input to the sediment transport system at Kirk Arrow may have been the catalyst for the changes at Pagham.

### 3.3.2.5 Summary of feedback

- Artificial beach bypassing would be necessary.
- The frequency of beach bypassing is important to get right.
- There is a concern that artificial beach bypassing may not be able to match the current natural sediment transport processes.
- Shingle import (beach recharge) may also have to be used in conjunction with beach bypassing.
- There is a risk that the haven will have a negative impact on the local designated features.
- The beach bypassing operation is achievable.

## 3.3.3 Proximity to residential area

### 3.3.3.1 Feedback from Chichester District Council Planning Department

The advice given by the Chichester District Council Planning Department was limited being outside of the formal Pre-planning Application Advice charging scheme. The Planning Department noted that any formal advice in the future will only be provided under the remit of a Pre-application however the Department was able to provide some informal comments on what a planning application should include as follows:

- An assessment of the level of activity at the site, so the impact on the residential properties and surrounding site can be assessed.
- What uses / structures are proposed within the fisheries compound and the public / quayside area.
- The route those wishing to walk along the coast would take and the connectivity between either side of the haven.
- More detailed drawings would be required in order to properly illustrate the structure and quayside and its relationship to the adjacent land.
- Detail on access arrangements.
- Consultation with Chichester District Council's Environmental Health Officers regarding noise. It was felt that the haven was a little too close to the residential area on Kingsway and that there should be a distance of 30 metres. Currently the haven is 20 metres from the residential area.
- The lawful use of the amenity area to be excavated should be established. The loss of any public amenity value should be compensated for.
- West Sussex County Council should be consulted in subsequent stages with regards to Public Right of Way to discuss the process of diverting these rights at an early stage.

### 3.3.3.2 Summary of feedback

- The planning department provided a list of key elements that would need to be addressed as part of a planning submission / Environmental Impact Assessment.
- It was considered that the development should be moved approximately 10m further away from the residential properties.

## 3.3.4 Operation of haven

The advice given by the Chichester District Council Economic Development Department on the operation of the haven was as follows:

- The economic development department recognised that the location of the fishermen's compound close to the residential area posed no significant issues as the activity on the site will generally remain unchanged. There is however, an opportunity to 'tidy up' the area and improve the operation safety.



- It was recognised that the layout of the haven was appropriate with the fishing berths closer to the entrance area as they would be frequent users, therefore keeping the leisure berths separate.
- Leisure boats will need to be sufficient in number to ensure that the haven is economically viable as the District, Town and County Councils are very unlikely to be able to subsidise the operation of the haven so sufficient income streams will be essential.
- It is important to make use of the amenity area north of the haven by maximising the commercial activities and enhancing the facilities to strengthen the visitor economy in the area.

#### **3.3.4.1 Summary of feedback**

- It was considered that the general layout of the haven and surroundings was appropriate.
- It is important to make the best use out of the surrounding area.

### **3.3.5 Impacts on coastal management**

#### **3.3.5.1 Feedback from Chichester District Council**

Chichester District Council felt that there were both positive and negative impacts on coastal management. The positives were that the haven would replace a section of seawall which would reduce maintenance costs, as well as the removal of seven existing timber groynes that are reaching the end of their residual lives. The council also noted that the access ramps installed as part of the haven development could also be used for general maintenance access to the beach. The negatives were that additional localised management would be required (i.e. beach by-passing) without which the sea wall to the north would be at increased risk of undermining.

#### **3.3.5.2 Feedback from the Environment Agency**

The Environment Agency noted that much will depend on the specifics of the haven entrance (e.g. seaward extent and impact on tidal currents and subtidal sediment transport) and the details of the outer seawall (e.g. in relation to shape and wave reflection). They also noted that groynes up or down drift may need to be modified to increase storage capacity for bypassing or to increase the retained beach volume updrift of the haven to allow for larger losses.

They also noted that raising of the land behind this frontage will reduce flood risk and may lower the requirements of the beach to provide protection from flooding. However, the beach has a high amenity value so narrowing of the beach may be undesirable.

In the long term, the Environment Agency felt the Haven is unlikely to provide a sustainable flood defence solution as currently presented, and that it prevents future coastal adaptation that could include a more landward alignment of the coast for the location of the Haven as well as over a considerable distance up and down drift. However, the current policy within the Shoreline Management Plan is the Hold the Line and therefore the existing line of defence is likely to remain unchanged.

The Environment Agency has suggested that a decommissioning plan would be required in subsequent stages.

#### **3.3.5.3 Summary of feedback**

- The haven will reduce Chichester District Council's current maintenance requirements of the existing coastal structures (seawall and timber groynes) under the footprint of the haven.
- The haven's maintenance slipways will provide good access for the council to undertake general beach management activities either side of the haven.
- Any reduction in beach levels either side of the haven could destabilise the current seawall structures.

- The haven could restrict the longer term coastal management of the frontages at and either side of the haven.

### 3.3.6 General comments

This section outlines and discussed other comments that were received during the consultation.

The Selsey Fishermen's Association had the following comments:

- The haven will allow the existing fishing fleet to work in a safer and more secure way.
- The haven should not be built on a business model that relies on increasing the number of fishing vessels to be economically viable as this is not an environmentally sustainable approach.
- For a successful haven we would need to concentrate on Charter boats, Dive boats and commercial lettings like restaurants and services if possible to create a resilient income.

## 4 Preliminary business case

A preliminary business case has been prepared by Vail Williams for the development, construction and operation of the haven in order to determine its optimum size and capacity. The business case included ancillary operations such as cafes, retail outlets and other business considerations compatible with the concept option. Full details of the business case can be found in Appendix D. Below provides highlights and a summary of the conclusions.

The business case has been based on research into the local markets to establish anticipated levels of demand and expected pricing points for both leisure and commercial mooring facilities within a new haven at Selsey. Research was also undertaken into the indicative levels of demand and rental levels that might be anticipated for ancillary business operations.

The conclusions are necessarily relatively generic, particularly in respect of the ancillary retail, restaurant and other business operations. At this stage there is no point in being overly prescriptive on building sizes and precise occupiers of a proposed building. Such matters would require detailed input from architects, planners and other professionals to design a detailed scheme that could then obtain planning permission. The study is also some years away from the completion of any proposed haven, so even if we have identified specific likely occupiers of buildings today, then by the time the haven was built, such detailed information would be out of date.

The approach in respect to buildings therefore has been to consider the likely general levels of demands for different uses and to establish a reasonable level of rental value that might be expected for such ancillary business operations when placed in Selsey, adjoining a new small haven development.

A Profit and Loss forecast for the concept option was prepared over the first five years of its operation. The income figures are informed by the commentary outlined in Appendix D. Assumptions have been made as to the rates at which the commercial and leisure berths will fill, assuming that it will take longer to fill the leisure moorings than it would the commercial and fisher boat berths. Maximum occupancy of the leisure berths has been assumed at 80% occupancy levels. A mooring rate of £300 per metre including VAT has been adopted which is a competitive figure when compared with the other Chichester haven marinas that offer deep water moorings.

The forecast shows that over the first five years of operation the haven should be able to generate a sustainable income level of over £300,000 per annum once it is trading to capacity. This includes the rental income to be generated from the commercial buildings as well as the moorings. It does not however include any additional development such as fish processing plant etc.

Reasonable allowances have been made for operating costs and overheads. This includes a figure for a rental to be paid to the Crown Estate, assuming that at least part of the haven development extends below the high water mark, onto Crown owned sea bed. The Crown Estate would generally seek a proportion of moorings income as their rental basis. It is expected that, because the majority of the haven is to be built on dry land, with only a small proportion on Crown sea bed, that this percentage will be quite modest. We have however adopted a full rental in order to provide a prudent and robust profit projection.

Assumptions have also been made to the likely staffing levels and costs. A small haven of this nature should be relatively efficient to operate, requiring limited staffing levels. It has been assumed that up to three full time equivalent employees. This assumes that there is no need for a powered cill gate or similar at the marina entrance. If there is a need for such plant and machinery needing 24-hour manned operation, then the staff and general operating costs may well increase.

Allowances have been made for other operating costs that we consider to be reasonable given our experience and knowledge of other marina operations elsewhere in the UK.

These initial costs projections do not include any costs for the dredging of the haven or its entrance, or for beach bypassing operations. The extent of these operations will clearly be the key to ensuring the viability of the overall scheme. These are dealt with in a little more detail below.

Subject to the various assumptions set out it is our opinion that the Selsey Haven marina has the potential to generate significant operating profits, provided that it can be run efficiently and provided that its design and promotion enables it to secure reasonable levels of occupancy, both in respect of leisure moorings and commercial building tenants. Before dredging and beach bypassing costs are taken into account, we would expect the net profit levels, once the haven is fully operational should be capable of exceeding £150,000 per annum. This is assessed on an EBITDA basis, which is commonly used for assessing the day to day trading performance of moorings operations.

Our trading projections reflect a net profit margin of circa. 50% of the fully trading turnover level, which we consider to be a reasonable level given our knowledge and experience of other marina trading operations.

The capital costs for initial construction of the haven are not included within these figures as they assume that the capital funding is provided by other means and is not funded directly from the income generated by the haven business.

Trading Projections	Year 1	Year 2	Year 3	Year 4	Year 5
Annual mooring income	£173,000	£199,980	£227,482	£255,515	£258,070
Building rents	£52,000	£52,000	£52,000	£52,000	£52,000
Diesel sales gross profits	£6,000	£6,060	£6,121	£6,182	£6,244
other/misc income	£1,000	£1,010	£1,020	£1,030	£1,041
<b>Total Turnover / Gross Profit</b>	<b>£231,000</b>	<b>£258,040</b>	<b>£285,603</b>	<b>£313,696</b>	<b>£316,313</b>
<b>Overheads &amp; expenses*</b>	<b>£156,240</b>	<b>£152,346</b>	<b>£153,074</b>	<b>£158,014</b>	<b>£160,969</b>
<b>Net Profit (EBITDA)</b>	<b>£74,760</b>	<b>£105,694</b>	<b>£132,529</b>	<b>£155,683</b>	<b>£155,344</b>

\* Shingle bypassing and dredging maintenance costs are not included within these figures.

There is a clear requirement for the need for beach bypassing to deal with the build-up of material at the haven entrance and to maintain the supply of sediment towards Pagham. Based on the sediment transport information provided in Section 2.5, net transport rates along the coast at Selsey could be between 10,000 and 20,000 cubic metres with present coastal management.

Following further consultation with a local contractor it has been estimated that beach recycling / bypassing operations would cost between £80,000 and £160,000. This does assume that no sediment is naturally bypassed and therefore the cost is likely to be reduced.

**Please note, these figures have been refined following further consultation. These updated figures are presented in Section 5.3.4, on Page 30).**

Dredging costs have been estimated at approximately £30,000 per annum. These figures are not included in the above costs.

The following has been used for the basis of the beach bypassing costs:

- Estimated cost per cubic metre: £8.00
- Cost for mobilisation and demobilisation: Inclusive within the cost per cubic metre.
- Total annual volume of shingle bypassing required. Maximum transport rates have been noted at up to 20,000 cubic metres.

For dredging the following has been assumed:

- Estimated cost per cubic metre: £10.00
- Estimated dredging: 3,000 cubic metres per year.

Note for dredging maintenance the costs are less certain as it is not possible without detailed modelling to know how material will deposit within the haven.

If the haven is to remain viable the bypassing and dredging operations have to be funded from the trading profits of the haven.

It is our estimate that trading profits should be capable of achieving a minimum of £150,000 per year. Some of this surplus should be set aside for irregular larger maintenance items, such as eventual replacement of pontoons, electrical equipment, etc. It would be our recommendation that you should aim to keep the cost of beach bypassing and dredging operations to no more than £100,000 per annum as an absolute maximum in order to ensure the long term viability of the Selsey Haven Scheme.

## 5 Revised concept design following consultation

### 5.1 Revised concept design introduction

The concept design presented in Section 2 was updated in response to key comments provided above. Notably these are the comments associated with sediment transport, beach bypassing and coastal management. Taking these comments into account, and in discussion with Selsey Fishermen’s Association, Selsey Town Council and Chichester District Council, the changes made in the revised concept design were as follows:

- A landward retreat of the haven location.
- The seaward face of the haven to run along the existing alignment of the seawall.
- The haven entrance arms to only run down to mean low water springs.
- Maintaining a 30m distance from the residential area.

Note that revised internal layout of the haven is based upon initial sketches provided by Chris Russel of Marine Infrastructure Planning and Design.

### 5.2 Revised concept design

The revised design is presented below in Figure 5-1.

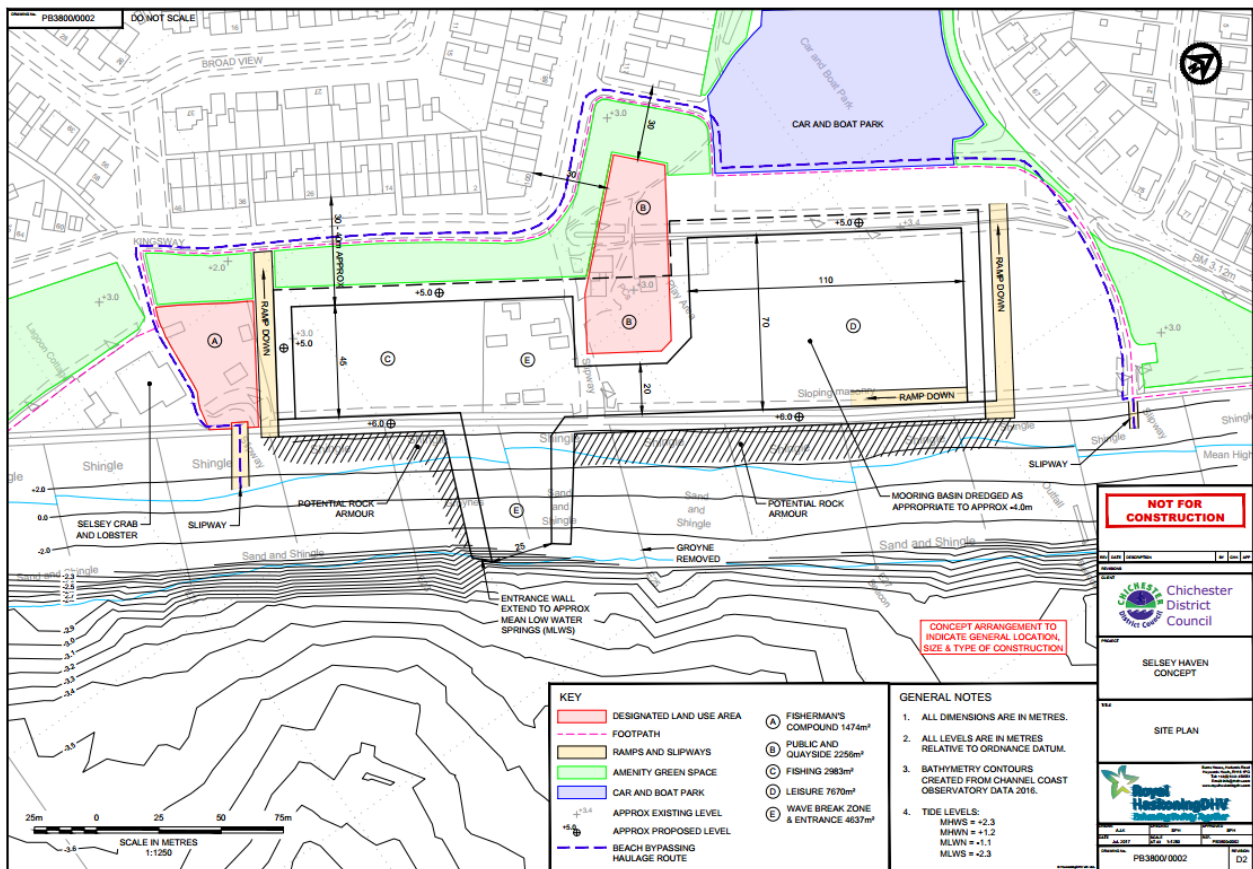


Figure 5-1 - Revised concept design following 2017 consultation feedback

## **5.3 Revised concept design consultation**

Royal HaskoningDHV undertook further consultation with Natural England and the Environment Agency on the revised concept design to obtain further feedback on sediment transport, beach bypassing and coastal management. Alongside this, impacts on the preliminary business case were considered.

### **5.3.1 Sediment transport**

#### **5.3.1.1 Feedback from the Environment Agency**

The Environment Agency provided an update to the 2003 to 2012 Selsey Bill to Brighton Marina sediment budget report titled 'Selsey Bill to Climping Regional Shingle Sediment Budget', which now covers a period from 2007 - 2017. The study suggests that during 2007 – 2017 there has been no sediment input from offshore which has a notable impact on the calculated average longshore transport rate along Selsey East Beach, and suggests that the Selsey Peninsula has suffered annual erosion rates of 2,465 cubic metres of which 2,323 cubic metres moves east towards East Beach. This is a significant reduction compared with the previous figure, provided under the 2003 to 2012 study, which suggested an offshore to onshore sediment feed of 12,500 cubic metres of per annum with 18,374 cubic metres of this moving towards East Beach. See Figure 5-2.

The report also indicates that the beach fronting East Beach Green has suffered annual erosion of 3,462 cubic metres and that 7,709 cubic metres of sediment per annum is transported past East Beach Green. This is a reduction in the previous figure, provided under the 2003 to 2012 study, which suggested that the beach accreted 1,949 cubic metres per annum whilst 17,500 cubic metres of shingle is transported past East Beach Green. While this suggests a lower volume of sediment transport per annum, it also highlights the potential uncertainties in determining sediment transport rates.

The shingle beaches down drift of the proposed haven towards Pagham have accreted annually. This suggests that although there has been a reduction in sediment transport from updrift, there is sufficient sediment transport and supply from offshore to maintain beach volumes.

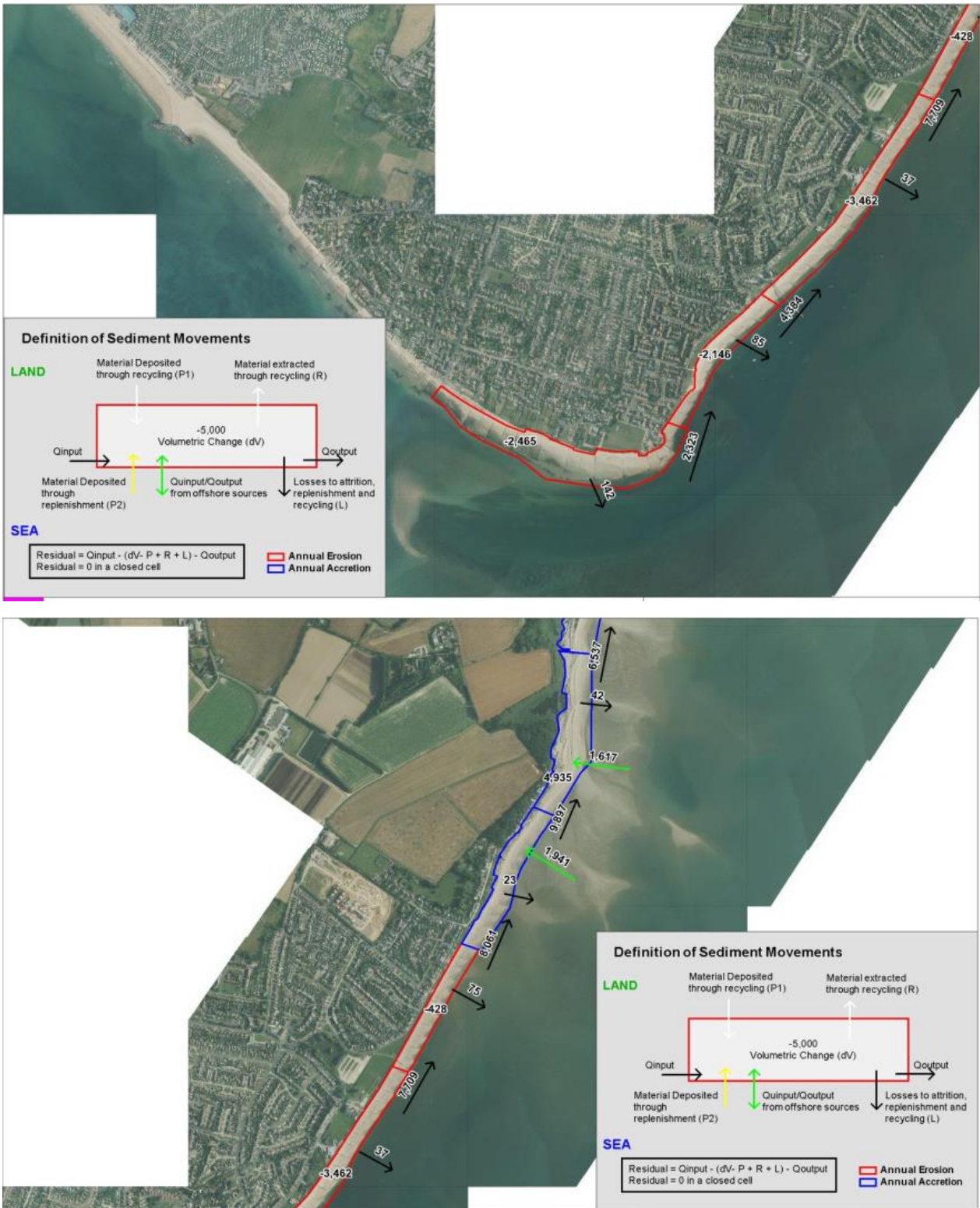


Figure 5-2: Sediment Budget along Selsey. Extract from the Regional Shingle Sediment Budget: Selsey Bill to Brighton Marina (2007 – 2017).



## 5.3.2 Beach bypassing

### 5.3.2.1 Feedback from Natural England

Natural England acknowledged that the intention of the revised design is for the haven arms to 'act just like the current groyne system does', therefore minimising the impact on sediment transport'. However Natural England were still concerned that the revised harbour arms would have a greater effect on the sediment transport system than the existing timber groynes currently have.

Natural England comment that the haven entrance in itself will still disturb longshore sediment movement. Whilst the impact of the haven entrance could be subject to additional studies and numerical modelling. They said that anecdotal evidence from other harbours on this stretch of coastline would indicate (for example) tidal flushing to be a likely effect, causing complexities when considering the bypassing of sediment.

Natural England would welcome additional studies and or numerical modelling to support an evidence base which shows that the 'natural' sediment transport regime can be feasible and sustainable.

### 5.3.2.2 Feedback from the Environment Agency

The Environment Agency acknowledged that this option was more in line with what they had in mind. They recognise that the beach can continue to occupy the same space as at present and thus does significantly reduce the impacts on the present beach.

Their view was that accommodation for shingle build-up up and down drift of the haven would be minimal as the harbour arms essentially act like a concrete groyne. If artificial bypassing were required, the Environment Agency suggested that it was important to consider a solution to allow a near-continuous bypassing mechanism (i.e. minimal disruption to natural sediment transport).

The Environment Agency noted that the above may be difficult, but with natural sediment transport being a main issue, providing evidence that a near continuous system would be achievable could possibly leave little objection on sediment transport grounds.

The Environment Agency notes that it is inevitable that some shingle will naturally enter the haven channel as it bypasses.

Overall, the Environment Agency acknowledged that this option will have less / much less of an impact on sediment transport depending on the bypassing methodology.

## 5.3.3 Coastal management

### 5.3.3.1 Feedback from the Environment Agency

The Environment Agency questioned the requirement for rock armour in front of the seaward face of the Haven, however appreciated that this might provide a factor of safety. The Environment Agency also noted that the haven duplicates the seawall with the seaward and landward wall and failure of the wall would have negligible consequence in terms of flood risk to people and properties. Flood risk would be limited to the boats in the harbour.

The Environment Agency noted that the haven would continue to restrict the longer term coastal management of the frontages at and either side of the haven.

### 5.3.4 Preliminary business case

The following comments have been made on the preliminary business case.

- It is assumed that the revised layout will accommodate the same number of vessels as originally anticipated. The only difference is that, rather than all states of tide access, the access into and out of the haven is unlikely to be possible for a period of around 1 to 2 hours either side of low spring tides.
- The haven would still be accessible for the majority of the time, i.e. over the typical 12 hours tidal cycle the haven should be accessible for at least 10 to 11 hours.
- Selsey East Beach is exposed in rough weather conditions, especially easterlies. The design will need to ensure where possible that vessels in the haven are protected in all sea states / wind directions, something which can be dealt with at latter design stages.
- Equally important to the above point is to ensure that boats can get in and out of the haven in rougher sea states. This is something that would have to be modelled alongside consultation with local users (especially fishermen).
- It is anticipated that the preliminary business case figures will not change as part of the revised design. However, given that access into the haven will not be possible at all states of the tide, a sensitivity analysis has been undertaken to model the effects on the net profit of the marina if occupancy and / or pricing levels were below expectations. The table below shows the impact on the year 5 net profit (on an EBITA basis) of reductions in these two key factors. Only the leisure mooring tariff has been reduced, with the fisherman / commercial tariff remaining as before.

#### Mooring tariff adjustment

		0		-10%		-20%	
<b>Occupancy adjustment</b>	<b>0</b>	£	155,344	£	136,197	£	117,050
	<b>-10%</b>	£	136,197	£	118,964	£	101,732
	<b>-20%</b>	£	117,050	£	101,732	£	86,414

Note: these net profit figures are shown *before* deducting any costs for dredging or beach bypassing

- The analysis shows a range from a high of ~£155,000 with no reductions, down to a low of ~£86,000 net profit if both occupancy and the leisure boat mooring tariff drop by 20%. If both drop by 10% then the net profits should be around £100,000.
- If dredging and beach bypassing can be achieved for less than £100,000 then the haven should be able to pay for itself on a day to day basis, but of course it could mean little or no surpluses being produced to fund occasional larger repair and renewals.
- With the recent calculated annual sediment transport rates, bypassing operations could reduce to around £64,000 per annum (taking a conservative, maximum 8,000 cubic metres of shingle per annum, based upon the 2017 Regional Shingle Sediment Budget study). This highlights the likely annual variation in transport rates and the subsequent likely annual variation in bypassing costs. Dredging costs remain at an estimated £30,000 per annum.

As part of the preliminary business case considerations, the possibility of including housing on the new concept design was considered. Below provides a summary of this.

- A 2 or 3 storey housing development would dominate the water front and block out any views from the existing housing behind and is unlikely to gain support from planners.
- The primary use of the haven ideally would be for a quasi-industrial purpose, namely the landing and processing of fish. There is likely to be a significant degree of conflict between the use and the owner/occupiers of any immediate new properties. Any new properties would not be accustomed

to the current fishing practices and these are likely to fuel complaints and conflicts with any new occupier (for example, if the tides require boats to come back to the harbour at say 7am on a Sunday morning, resulting in noisy landings).

- Apartments overlooking both a marina/haven and the seafront would be valuable and should deliver development profits, but in the context of the anticipated cost of the overall development, we don't see a small number of flats as making much of a dent in the overall funding need.
- There is one possible exception which is a marine manager's flat, giving the option to provide accommodation to a manager as part of his/her remuneration. To have a permanent manager present on site could be useful. Clearly though, a single flat for this use is not going to make a material difference to the economic model for the haven.

## 5.4 Construction cost estimation

Construction costs have been developed in accordance to the concept design. The main construction of the harbour will be in twin walls of steel piles with a concrete deck. Most of the walls will be in steel sheet piling (a non-permeable face) but in key locations intermittent piles will be used that present a permeable face. Where there are two lines of steel piles, general granular fill will be placed between them. Where intermittent piles occur, armour stone fill will be used. The use of armour stone in this way will reduce wave reflections off the wall and provide some absorption of wave energy.

Permeable walls will be used around the entrance area and along the seaward face of the Haven. For the entrance area the intention is to facilitate access into the Haven under heavy sea conditions. For the seaward face the intention is to encourage the build-up of beach material in front of the Haven in order to promote natural by-passing.

The entrance area and mooring basin will be excavated to provide a near all-tide facility. From the excavation arising the beach material will be placed on the foreshore to the north and the rest of the material will be placed on the green area to the north in order to raise ground levels to the same level as the existing seawall promenade.

The construction costs have been estimated to fall within the following range: **£14 to 19 million**.

The costs include:

- Construction works;
- General and preliminaries;
- Further site investigation and design;
- Construction project management;
- Health and safety management;
- Site supervision, and

The costs exclude:

- The cost of internal pontoons and berths.
- Dealing with potential contaminated land.

## 6 Conclusion and recommendations

### 6.1 Summary of key issues

Key Issues
<p><b>Sediment transport</b></p> <p>The general sediment transport direction is from the south-west to the north-east. Further detail is provided in Section 2.5, on page 10.</p> <p>The consultees provided some further commentary on this but confirmed that our general understanding of sediment transport processes is correct.</p>
<p><b>Beach bypassing</b></p> <p>Artificial beach bypassing would be necessary.</p> <p>The frequency of beach bypassing is important to get right.</p> <p>There is a concern that artificial beach bypassing may not be able to match the current natural sediment transport processes.</p> <p>Shingle import (beach recharge) may also have to be used in conjunction with beach bypassing.</p> <p>There is a risk that the haven will have a negative impact on the Pagham Harbour SSSI.</p>
<p><b>Proximity to residential area</b></p> <p>The planning department provided a list of key elements that would need to be addressed as part of a planning submission / Environmental Impact Assessment.</p>
<p><b>Operation of haven</b></p> <p>It was considered that the general layout of the haven and surroundings was appropriate.</p> <p>It is important to make the best use out of the surrounding area.</p>
<p><b>Coastal management</b></p> <p>The haven will reduce Chichester District Council's current maintenance requirements of the existing coastal structures (seawall and timber groynes) under the footprint of the haven.</p> <p>The haven's maintenance slipways will provide good access for the council to undertake general beach management activities either side of the haven.</p> <p>Any reduction in beach levels either side of the haven could destabilise the current seawall structures.</p> <p>The haven could restrict the longer term coastal management of the frontages at and either side of the haven.</p>
<p><b>Business Case</b></p> <p>Selsey Haven has the potential to generate significant operating profits.</p> <p>Before dredging and beach bypassing costs are taken into account, the net profit levels, once the haven is fully operational should be capable of exceeding £150,000 per annum. A sensitivity assessment of a reduction in mooring tariff and occupancy by 20% shows that net profit levels could reduce to around £86,000.</p>

For beach bypassing, the cost estimate is £64,000 per annum and dredging is an additional £30,000 per annum, totalling £94,000 per annum. This is based upon the latest sediment transport rates of 8,000 cubic metres per annum of shingle bypassing.

## **6.2 Recommendations**

### **6.2.1 Sediment transport**

There are no further recommendations at this stage.

### **6.2.2 Beach bypassing**

The potential impact of the proposed haven on the natural sediment transport processes, even taking into account the proposed artificial beach bypassing, is of concern to the consultees and there is uncertainty over the magnitude of the potential impact. It is recognised that artificial beach bypassing, and potential importation of beach material, would go some way to alleviate these concerns.

Feedback suggests that by moving the haven landward and shortening the proposed entrance arms will have less impact on sediment transport providing a near continuous system can be achieved. There are however still concerns over this.

We therefore recommend undertaking numerical modelling to determine an optimised layout of the haven entrance with the aim of minimising any impact on natural sediment process. Alongside this, numerical modelling will help towards understanding better the quantity of artificial beach bypassing, and any potential beach recharge, that may be necessary.

Numerical modelling will also assist significantly in discussions with regulators over the acceptability of the proposed haven.

The costs associated with artificial beach bypassing could be significant, in relative terms to the forecast net profit of the haven. Numerical modelling will therefore give greater confidence on the operations costs associated with any necessary beach bypassing.

### **6.2.3 Proximity to residential area**

The lawful use of East Beach Green should be established. This will identify whether the haven can move to a more land based option and the likely impacts and objections from Chichester District Council. It has been noted that any loss of public amenity value should be compensated for.

### **6.2.4 Coastal management**

There are no further recommendations at this stage.

### **6.2.5 Business case**

The haven could achieve a profit of £150,000 per year. Sensitivity tests show that this could drop to £86,000 per annum if mooring tariff and occupancy are both reduced by 20%. Further work should be undertaken to increase the accuracy of the bypassing and dredging cost estimates.

### 6.3 Summary of recommendations

The above recommendations are summarised as follows:

- Undertake numerical modelling to determine an optimised layout of the haven entrance.
- As part of the above determine an optimised beach bypassing, and potential beach recharge beach maintenance regime with a view of minimising operational costs.
- Identify the likely impacts and objections from Chichester District Council if the Haven is relocated onto East Beach Green.
- Further work should be taken to increase the accuracy of the beach bypassing and dredging cost estimates. This would form part of the above numerical modelling work.

## 7 References

Selsey Bill to Brighton Marina – Regional Shingle Sediment Budget 2013

Selsey Bill to Climping Appendix E – Regional Shingle Sediment Budget 2017

Selsey Bill and the Hounds rMCZ proposed new boundary. Natural England.

SCOPAC Sediment Transport Map. Retrieved from <http://www.scopac.org.uk/sts/eh-pa.html>

SCOPAC East Head to Pagham, West Sussex Literature Review. Retrieved from <http://www.scopac.org.uk/sts/eh-pa-literature-review.html>

## **Appendix A**

### **Preliminary Consultation Report**

This appendix refers to the Stage 1 report reported to Cabinet 7 Feb 2017



## Appendix B

### Consultation Documents

[See Appendix 1 of Cabinet Report](#)

## Appendix C

### Consultation Feedback

This is not included in the Cabinet Report as the detail is not relevant to the report

## Appendix D

### Preliminary Business Case

[See Appendix 2 of Cabinet Report](#)

## Appendix E

### Ground Condition Sketches

This is not included in the Cabinet Report as the detail is not relevant to the report

## Appendix F

### Revised Concept Design

This is not included in the Cabinet Report as the detail is not relevant to the report

## Appendix G

### Revised Layout Consultation Feedback

This is not included in the Cabinet Report as the detail is not relevant to the report

